The Dissolution of Tremolite Asbestos in Artificial Lysosomal Fluid

Abstract:

Recent studies have suggested that asbestiform tremolite inclusions in asbestos may have a greater health impact than other asbestiform minerals. In this study, we look to evaluate the long-term leaching of tremolite to determine its durability. The leaching solution selected was an artificial lysosomal fluid (ALF) in an effort to mimic reactions that would occur in the lung. The ALF solution has a pH of 4.5 and is dominated by NaCl and citric acid. Dissolution experiments were completed on sand and silt particle size fractions that were separated by wet sieving and centrifugation for a total of 523 hours. Flow through columns were used with a flow rate of approximately 0.25 ml hr^{-1}. Results to date for Ca dissolution show a curvilinear trend for cumulative Ca removed. While the early portion of the experiment may be modelled as a linear first order reaction, the long term leaching shows a reduction in the release of Ca. The dissolution of Si and Mg follows a similar pattern but with a slower release rate. This suggests that Ca is removed preferentially over Mg and Si on a molar basis, consistent with incongruent dissolution and the formation of a leached layer. Leached particles will be analyzed by SEM and AFM to evaluate mineral surface features to further elucidate mechanisms of leaching.